

# **Does a Manager's Gender Matter when Accessing Credit? Evidence from European Data.**

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## **Abstract**

Firms can be credit constrained either because a loan has been denied by the lender or because they decide not to apply for such a loan due to expected rejection. Using a large sample of European small and medium enterprises, we investigate the relationship between gender and credit constraints. Although no evidence is found that financial institutions are biased against female managers, female-run firms are less likely to file a loan application, as they anticipate being rejected. As a consequence, firms managed by women obtain less bank financing.

*JEL Classifications:* A13, G21, J16

*Keywords:* Gender Discrimination, SMEs, Discouraged Borrowers, Credit Constraints

## **1. Introduction**

When Eliza Lucas Pinkney took over the management of a plantation from her father in 1738 at 16 years of age, she was not aware she would eventually be listed among the first and most legendary female entrepreneurs. Indeed, her success in introducing the cultivation of the indigo plant in South Carolina, which was in demand for its dye in the growing textile market, granted her a place in history (Mueller, 2012). Stories like hers substantiate the important role women can play in business and consequently the importance of reducing constraining barriers in order to give them the opportunity to fully utilize their managerial skills. Thus, it comes as no surprise that governments all around the world have progressively adopted regulations limiting potential gender

inequalities, such as equal pay and equal opportunity legislation or quotas to promote women's political representation (Blau and Kahn, 2001; Bush, 2011). However, despite these regulatory efforts and numerous success stories, women still struggle to reach the higher echelons of power and are a minority in national legislatures and corporate boards of directors (Bush, 2011; Grosvold, 2011). Furthermore, they are confronted with glass ceilings in their career progression and a gender pay gap that seems to persist globally (Arulampalam et al., 2007; Hausmann et al., 2008). In fact, attitudes towards these issues vary across different countries depending on their cultural and economic heritage (Alesina et al., 2013).

Earlier studies have investigated whether gender-related prejudice exists in the credit market but failed to reach a consensus. Research that relies on US data claims that, after controlling for a range of relevant factors, women who operate small businesses do not face discrimination (Blanchflower et al., 2003; Cavalluzzo and Cavalluzzo, 1998; Cavalluzzo et al., 2002). The denial rates, however, seem to show a significant discrepancy across different races, with African-Americans being particularly disadvantaged (Cavalluzzo and Wolken, 2005). Data from Trinidad and Tobago used by Storey (2004) corroborates the conclusion that female-owned businesses are not hindered in the credit market. On the other end of the spectrum, Muravyev et al. (2009), who use data from European and Asian countries, find evidence consistent with discrimination of female entrepreneurs by financial institutions. Even more surprisingly, Raturi and Swamy (1999) report that in Zimbabwe the probability of receiving a business loan conditional on applying is *ceteris paribus* lower for men.

Our work endeavors to contribute to the debate on potential gender bias by assessing whether firms led by female managers are constrained in accessing credit. We rely on a large survey of small and medium enterprises (SMEs) assessing their access to finance in the euro area, which was conducted by the European Central Bank (SAFE dataset). To the best of our knowledge, this data has not yet been employed to investigate gender-related aspects of credit constraints. The database we utilize is unique in that it provides information on whether firms have

been provided with credit by banks and also identifies ‘discouraged borrowers’, defined as those who would like to get a loan, but decide not to apply due to the fact that they anticipate rejection. To the best of our knowledge, there is only one prior study that explicitly modeled discouraged borrowers (Cavalluzzo et al., 2002). Their study used the US National Survey of Small Business Finances and concluded that application avoidance does not differ significantly by gender.

Our results confirm that financial institutions are not biased against women managers when considering the loan applications of their companies, as the likelihood of being successful is independent of gender. This holds true regardless of the concentration of the banking industry in a given country. Apparently banks allocate funds according to the creditworthiness of a firm and the increased use of figures-based credit scoring and credit rating tools may have contributed to constraining gender discrimination. More interestingly, female-run firms tend to apply less often, as they seem to be less confident of a positive outcome. This result regarding discouraged borrowers is at variance with those of Cavalluzzo et al. (2002), who examined the behavior of US entrepreneurs in the 1990s. Our findings have tangible implications for female managers, banks in general and their marketing strategies in particular. They are also subject to the caveat that, due to the limitations of our dataset, we are able to construct only very basic controls for credit risk.

The paper is organized as follows. The next section considers different viewpoints on credit access and discrimination. Against this background, we develop a number of testable hypotheses in section 3. Section 4 provides details on the dataset used, methodology and variable construction. The following section engages in a discussion of the summary statistics. Subsequently, we proceed to report the regression results, interpret our findings and consider a battery of robustness checks. The paper closes with concluding remarks and recommendations.

## **2. Credit Access and Gender**

SMEs are often constrained in accessing supplementary equity from their existing owners, who usually invest a substantial part of their wealth in the venture from its very establishment (Avery et al., 1998). Even if SMEs can turn to alternative providers of equity, such as business

angels or venture capitalists, new shareholders typically face big agency problems linked to the opaqueness that characterizes SMEs (Landström, 1992). In addition, entrepreneurs do not like the implementation of additional control and management tools, the reduction of freedom in managing the firm and limits on access to non-pecuniary benefits, all of which can materialize with the emergence of new shareholders (Delmar, 2000). Previous research stresses that SMEs can use other sources of finance, such as leasing and factoring (Beck and Demirguc-Kunt, 2006) or exploit bootstrap finance (Wingborg and Landström, 2000). Nevertheless, since the aforementioned sources often cannot cover all of their financing needs, SMEs turn to banks.

Diamond (1984) models banks as delegated monitors. Since savers do not have the skills, competences and resources to evaluate the creditworthiness of potential borrowers, they delegate this activity to banks. Indeed, a bank's lending decision is based on collecting information about the customer in order to evaluate them and their creditworthiness. The greater the ability to accurately perform such evaluations, the greater the mitigation of risks and the better the bank's performance in terms of long-term profit (Beltratti and Stulz, 2012; Fredriksson and Moro, 2014; Rasiah, 2010).

### ***2.1 What Affects Access to Credit?***

Traditionally, literature on lending investigates credit access by looking at the amount of credit obtained by a firm and suggests that the time spent on producing and collecting information is of key importance. Indeed, the information the bank can access facilitates the identification of borrowers that present moral hazard and adverse selection risks (Berger and Udell, 2002; Diamond, 1984). Since a longstanding relationship provides banks with a great amount of private information and older firms can rely on an established reputation, both the length of the relationship and the age of the firm are found to increase the amount of credit provided (Angelini et al., 1998; Berger and Udell, 1995; Petersen and Rajan, 1994). Financial institutions are also more supportive in providing credit because of the closeness of the relationship (Dell'Ariccia and Marquez, 2004), pre-existent relationships that are not necessarily linked to previous lending

experiences (Degryse and Van Cayseele, 2000), and the concentration of the financial system (Beck et al., 2006). Moreover, since the value of private information increases when it has been gathered by one bank or very few banks, borrowing from multiple sources can reduce the amount of credit a financial intermediary is happy to loan. The precision of the information provided is also found to play a crucial role in lending decisions - the higher the information quality, the easier it is for the bank to evaluate the riskiness of the firm and grant credit (Elsas and Krahnen, 1998; Elsas, 2005; Lehmann and Neuberger, 2001; Moro et al., 2015)

Research suggests that lending activity is quite peculiar and that not all borrowers will find the financing they require. Stiglitz and Weiss (1981) point out that it may not be sensible for banks to raise interest rates in order to cope with additional risk, since higher interest rates attract riskier projects with a relatively lower likelihood of repayment. Wette's (1983) model suggests that banks can use pairs of collateral and interest rates to give to firms the opportunity to self-select. The conclusion is that, even in a situation of market equilibrium, some firms will have unmet credit needs.

## ***2.2 Gender Discrimination and Credit Access***

The literature distinguishes between two types of discrimination, namely prejudicial and statistical. Statistical discrimination occurs in situations characterized by imperfect information, where data on important indicators, such as true productivity or creditworthiness, is difficult and costly to obtain directly. In pursuit of cost-savings, a financial institution may be tempted to infer this data from easily observable demographic characteristics of individuals (Arrow, 1973; Phelps, 1972). The evaluations will be consequently dependent on the preconceptions of the decision-maker, however they may not necessarily be motivated by antagonism towards minority groups or a particular gender. Instead, their motivation is rooted in economic considerations and, as a consequence, statistical discrimination, in contrast to ordinary prejudice, can be used when a bank pursues profit-maximization (Muravyev et al., 2009). While this may be the case, Phelps (1972) perceptively notes that “discrimination is no less damaging to its victims for being statistical”.

Prejudicial forms of discrimination are taste-based and can be defined as lack of adherence to objective criteria in formulating judgments on individuals. Becker (1971) carries out pioneering research on this issue and considers a wide range of economic ramifications that arise in this context. According to his theoretical formulation, those who are biased would be willing to forgo potentially profitable market transactions in order to avoid interaction with members of a minority group. Competitive pressures existing within the banking sector, however, will act to restrain such inefficient behavior. Becker's argument is based on the critical assumption that banks set the price of loans in order to clear the market. Ferguson and Peters (2000) note that whenever credit rationing exists within the marginal credit class, financial institutions could engage in some degree of prejudicial discrimination without sacrificing any profits. In the presence of rationing, similar individuals or companies are, by definition, treated differently, which provides a basis for costless discrimination.

While the issues related to discrimination are complex and multifold, what is of great importance to our particular inquiry is whether the gender of the manager is a factor that determines credit availability. Empirical findings regarding this issue are far from conclusive. Even if Wilson et al. (2007) explain that as long as women are successful in running their business no discrimination is in action and Cavalluzzo and Cavalluzzo (1998) suggest that financial institutions are not biased against women, evidence of discrimination is found in the work by Bellucci et al. (2010). They discover that, on the one hand, female entrepreneurs are more likely to be denied credit and, on the other, that female loan managers are more prudent in their lending decisions. Interestingly, women are not necessarily discriminated against by men, since female loan managers are found to be more likely to deny credit to female entrepreneurs (Saparito et al., 2013). Moreover, firms with female leadership are found to face different loan contract terms that put them at a relative disadvantage (Fabowale et al., 1995). It may be due to the fact that the characteristics attributed to successful entrepreneurs are more commonly ascribed to men (Buttner and Rosen, 1988).

Cavalluzzo et al., (2002) postulated that discriminating financial institutions may increase interest rates for groups for which they feel aversion. The interest premium charged would act as compensation to the lender for the loss in utility, but it would preclude lending transactions that could be potentially profitable at a lower interest rate. However, from the perspective of Stiglitz and Weiss (1981) and Wette (1983), banks may be reluctant to increase interest rates as this may generate a sub-optimal situation of increased risk. Instead, in pursuit of expressing their potential biases (should they have any), financial institutions may resort to differential credit rationing across groups.

### **3. Hypotheses**

Our analysis is based broadly on the framework suggested by Cole (2008) and Cressy (2012). The first step a firm takes is to verify whether it needs finance and, if this is indeed the case, a decision on whether to apply for a loan will have to be made. Management may seek alternative sources of finance (e.g. leasing, trade credit, etc.), or may be discouraged from applying, anticipating rejection by the lender. If the firm decides to submit a loan application, it will either have its needs satisfied or become an unsuccessful applicant. Gender could potentially play a role in all the above-mentioned steps.

Extant literature suggests various reasons why the borrowing approach may differ across genders. Women are found to be more conservative in managing their firms, their enterprises are *ceteris paribus* smaller and face a lower growth rate than firms run by men (Cooper et al., 1988). In addition, women perceive themselves as less entrepreneurial and managerial than men (Buttner and Rosen, 1988). Consequently, women are expected to be less likely to apply for loans than men:

*H1: Female-led enterprises are ceteris paribus less likely to apply for a bank loan than male-led ones.*

A managerial decision not to apply for a loan may certainly be made because alternative



sources of financing are available or because additional finance is simply not needed. However, it can also be linked to the fact that a firm's management considers the probability of success to be very low and thus decides against applying. Such pessimistic expectations can be linked to a lack of confidence required to file a loan application, which can be particularly strong among female managers. Indeed, the research by Barber and Odean (2001) in the context of the stock market documents that men are more confident and, as a result, trade more frequently. Share trading aside, women may be also reluctant to apply for loans, as they may erroneously believe that they will be discriminated against, even in situations where financial institutions are free of gender-related biases. Interestingly, an earlier study by Cavalluzzo et al. (2002) suggests that, on average, women in the U.S. do not exhibit greater fear of rejection and therefore should not be labeled 'discouraged borrowers'. At the same time, clear evidence of discrimination is found in the Italian context by Bellucci et al. (2010), who find that female entrepreneurs are more likely to be denied credit and thus could be more discouraged from applying for a loan. Moreover, firms with female leadership also tend to face worse loan contract terms (Fabowale et al., 1995) - an additional reason to be discouraged. Thus we propose the following hypothesis:

*H2: Female-run firms are ceteris paribus more likely to be discouraged from applying for a loan due to anticipated rejection.*

Some of the prior research (focused mainly on the US) finds no gender discrimination as far as bank activity is concerned (Blanchflower et al., 2003; Cavalluzzo and Cavalluzzo, 1998; Wilson et al., 2007), even if in some cases such findings are affected by the level of bank competition in the area. More recent results based on the European context such as the work by Bellucci et al. (2010) in Italy, and on broader dataset that includes observations from both developed and developing economies (Muravyev et al., 2009) support the notion of gender discrimination. These latter results are more recent and derived from a setting more akin to ours, in that they also consider the European environment. Thus, we developed the following hypothesis:

*H3: Female-run firms are ceteris paribus more likely to be denied bank loans.*

## **4. Data and Methodology**

### **4.1 Data**

Our research relies mainly on the Survey of Access to Finance of Enterprise (SAFE) conducted on behalf of the European Commission and the European Central Bank. It collects information about access to finance by enterprises within the European Union. The SAFE survey has been run on a given set of questions every 6 months since 2009 and systematically covers 13 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Netherlands, Ireland, Italy, Luxemburg, Malta, Portugal and Spain). The questionnaire is translated into the local language.

Firms in the sample are randomly selected from the Dun & Bradstreet. The sample is stratified by firm size class, economic activity and country. The number of firms in each stratum of the sample is intentionally modified to increase the accuracy of the survey by activity and size class. As regards stratification by firm size class, the sample is constructed to offer approximately the same precision for micro (1 to 9 employees), small (10 to 49 employees) and medium-sized firms (50 to 249 employees). A group of large firms (250 or more employees) is also included. The sample sizes for each economic activity are selected to ensure adequate representation across the four largest activities: industry, construction, trade and services. The statistical stratification takes into account economic activities at the 1-digit level of the European NACE-Nomenclature. Agriculture, forestry, fishing, financial intermediation, public administration, activities of households, extra-territorial organizations, as well as bodies and holding companies are excluded. Finally, the sample sizes in different countries are selected on the basis of representation at the country level.

We integrated the data provided by the SAFE dataset with information from the quarterly Bank Lending Survey (BLS) run by national central banks on behalf of the European Central Bank. The BLS collects information about banks' lending activity in the previous three months

and banks' propensity to lend in the next six months. The survey provides specific data on banks' propensity to lend to large, small/medium firms and households. We use the data on large and small/medium firms in the previous three months as controls for the availability of credit in the market.

We also rely on the Eurostat database for general economic data on GDP growth, unemployment rates, and inflation. Herfindhal-Hirschman indices of bank concentration are downloaded from ECB Statistical Data Warehouse. Finally, we download data on government cash surplus/deficit relative to GDP and on ratio of bank nonperforming loans to total gross loans in a given country from World Development Indicators published by World Bank.

#### ***4.2 Methodology***

We carry out the analysis in steps in a way similar to Piga and Atzeni (2007) and Guiso (1998). Firstly, we examine whether gender affects the decision to apply for a loan (hypothesis H1) by using the entire dataset (41,973 observations). In this case, we use the answer to the question "Did you apply for a loan during the last period?" and create a dummy indicating whether the firm applied for a loan (1) or not (0). Subsequently, we investigate the reason why the firm did not apply for a loan by examining the relationship between gender and application self-exclusion due to the expectation of being rejected (hypothesis H2). The dummy variable identifies whether the firm did not apply because a rejection is anticipated (1) or otherwise (0). In this case we use the sub-sample that considers only non-applicants (31,326 observations). Finally, we examine whether gender is one of the determinants of success in obtaining credit from a bank (hypothesis H3) by using the sub-sample that contains only firms that applied for a loan (10,647). The dummy variable we use discriminates between successful (1) and unsuccessful (0) applicants.

Since all the dependent variables in our regressions are binary, we approach the analysis using pooled logit regression (Hosmer and Lemeshow, 2000). Maximum likelihood method is used to estimate regression coefficients. We rely on a panel dataset that is unmatched at firm level, which prevents us from employing fixed effect panel regression and examining the evolution of

lending relationships through time at firm level. We do not apply any non-linear transformations to our explanatory variables, as most of our company-specific controls are binary in nature, while the macroeconomic aggregates are conventionally untransformed in the extant literature.

To check the robustness of our findings we carry out additional analysis. We re-test our third hypothesis by considering the point raised by Becker (1971). He argues that prejudicial discrimination raises a firm's costs and the existence of competition should be able to mitigate this type of discrimination in the long run. In order to examine this claim, we follow use an approach similar to that implemented by Cavalluzzo and Cavalluzzo (1998), namely the original specifications used to test H3 are re-estimated by entering the interaction variable between gender and market concentration (and simultaneously dropping the market concentration index from the controls). In this case, the coefficient of gender continues to capture across-cluster differences that can arise once the competition-mitigating effect is taken into consideration.

In addition, our approach might raise questions about sample selection bias. Thus, we re-estimate our hypotheses following Heckman (1979) approach. We employ the binary response model with sample selection, where the dependent variable indicates whether the firm applies for a loan - an approach similar to Piga and Vivarelli (2004). The identification of the selection equation requires variable(s) that determine demand for a loan, but are irrelevant in the regressions used to test H2 and H3. We identify a good candidate in the variable that measures firms' need for additional finance. Indeed, this variable does not affect the probability that the lender will decide to provide finance.

An additional point that can be raised is that female entrepreneurs may be discouraged borrowers because their firms are weaker compared to the men-run ones. Regrettably, the dataset we use does not allow for a particularly detailed financial analysis of the companies. To address this problem, we performed two separate tests. Firstly, using data from the Bureau van Dijk's Orbis, we built a dataset that mirrors SAFE in terms of the proportion of female top managers, firms' turnover class and age, as well as country and industry composition. In this parallel sample,

we checked whether, on average, the riskiness of firms varies according to the gender of the top manager. This was achieved by examining three available ratios from Altman (1968) Z-score suitable for firms that are not listed. Tests were performed on the overall mirror dataset and on subsamples at country and at industry level. If creditworthiness does not differ significantly across gender, we will be able to rule out the possibility that female managers are discouraged borrowers due to inferior characteristics of their firms. Secondly, we use the limited data from SAFE in order to construct a raw credit score for the firms included in the SAFE dataset. This is accomplished by aggregating the age and firm dimension classes, a dummy that identifies whether the firm belongs to a group, and categorical variables capturing the dynamics of turnover and profit. We then re-estimate our model specifications including this credit risk measure. In doing so, we are able to better disentangle the gender effect from the creditworthiness of the firm.

#### ***4.3 Dependent, Independent Variable and Controls***

Our analysis uses three dependent variables from SAFE dataset. The first dummy identifies whether a firm applied for a loan, and takes a value of 1 for positive responses and 0 otherwise. Furthermore, for those firms that did not apply, SAFE survey asked for a reason behind such a decision. Three possible alternatives were given: 1) the firm did not need finance; 2) it did not apply due to anticipated rejection; 3) it did not apply for other reasons. Here we create a dummy indicating the refusal to apply motivated by the anticipation of rejection. Finally, the applicants were asked whether they were successful in obtaining a loan. In this case, our dependent variable takes the value of 1 (the firm obtained a loan) or 0 (the bank rejected the application).

The key independent variable we use is a dummy variable (WOMEN) that identifies the gender of the top manager of the firm (owner/director/CEO). It takes a value of 0 for male and 1 for female managers. The SAFE dataset provides unmatched observations for eight semesters, but only seven semesters contain data on gender. Consequently, our analysis excludes the first wave of the survey.

We also consider a set of variables to control for firm characteristics, the moment in time

when the data was collected, country and economic context. In terms of firm-specific characteristics, the SAFE dataset includes some information about size, since firms are grouped into four categories, namely micro, small, medium and large (captured by MICRO, SMALL, MEDIUM dummies). Our expectation is that larger firms are more likely to apply for loans due to the scale of their operations. In addition, they are less likely to face rejection, since they are perceived as more solid, diversified and successful.

Additionally, the dataset clusters observations according to four age categories: younger than two years, between two and five years, between five and nine years, older than nine years. We use <2YEARS, 2\_5YEARS, and 5\_9YEARS dummy variables to identify the age group for each observation. Based on previous research (Petersen and Rajan 1994; Berger and Udell 1995), we expect older firms to be more likely to submit a loan application and to be successful. We also consider whether the firm is independent (INDEPENDENT) or belongs to a group. Independent enterprises need more credit since they cannot exploit the financial resources of a parent firm and thus lenders can perceive them as weak.

Turning our attention to the economic performance of enterprises, we use a categorical variable (CHANGE\_TURNOVER) to identify whether the turnover experienced reduction (-1), stability (0) or growth (+1) in the semester considered. The same approach is applied to profit (CHANGE\_PROFIT). Regrettably, the SAFE dataset does not provide any information about monetary value of turnover and profit. According to previous research (Petersen and Rajan 1995; Berger et al. 2011), these two controls are expected to be positively related to borrowing decisions and inversely related to the likelihood of rejection. We also control for the financial strategy pursued by the firm by taking into consideration different sources of finance used during the last period. We employ dummies that identify whether the firm used retained profit (RETAINED\_EARNINGS), trade credit (TRADE\_CREDIT), leasing (LEASING), or whether it raised additional equity (EQUITY) in the last period.

In terms of the macroeconomic context in each of the sample countries, we control for the

percentage growth in gross domestic product (GDP\_GROWTH), inflation rate (INFLATION), overall unemployment rate (UNEMPLOYMENT) and the government cash surplus or deficit scaled by GDP (CASH\_SURPL\_DEFICIT). Our models also include a regressor capturing the quality of the financial system, which is measured as the percentage of the non-performing loans in a given country (NON\_PERF). For the first three of the abovementioned variables we use the average of the two quarters that belong to the considered semester, while the last two can be obtained only with yearly sampling frequency.

Moreover, we account for the overall financial situation by using the European Central Bank's BLS (Bank Lending Survey) coefficients for small/medium and large firms (CREDIT\_ACCESS). Since this index is not available for all the countries considered in the analysis, we use an average index for the countries with missing data. In fact, this happens only in a very limited number of cases and only for smaller nations. Additionally, we consider the structure of the financial industry by utilizing the Herfindahl-Hirschman index of bank concentration in each country (HHI), since previous research suggests effects of bank competition on credit access (Carbó-Valverde et al., 2009; Neuberger et al., 2008). Table 1 lists all of the variables used in our empirical analysis with their corresponding sources.

[TABLE 1 ABOUT HERE]

## 5. Descriptive Statistics

The dataset we use contains 41,973 complete original observations from 13 countries collected across seven rounds of data collection between second semester 2009 and second semester 2012. The summary statistics are reported in Table 2.

[TABLE 2 ABOUT HERE]

In our sample, 12.35% of firms are run by female managers and 87.65% by males. The majority are either micro or small and only 7% are classified as large. Three quarters of the firms in the sample are independent and a similar proportion is older than 9 years. All in all, the majority

of firms are small, independent and well-established. Only about a third of the enterprises exhibited an increase in turnover (35%), while the remainder experienced either stagnation or contraction. More than 44% had a reduction in profit, while only 29% enjoyed an increase. These statistics can be explained by the fact that observations start in the second half of 2009 and end in 2012, thus falling within a period of overall economic slowdown. In terms of financing, firms appear to use leasing (35% of the sample) and trade credit (36%) quite intensively. Retained earnings are used by around 30% of firms. The coefficient measuring the credit made available by the banking system (BLS data) is +4.08, which means that, on average, loan availability has decreased (positive values of CREDIT\_ACCESS are associated with contraction in credit provided by the banking system). This datum is in line with the more conservative lending policies pursued by the banking system after the 2008 financial crisis and the introduction of the more stringent Basel III rules. The gender and the loan application dummies have a highly significant Person correlation coefficient of -.0367, suggesting that women are less inclined to apply for bank credit.

Moving from the overall dataset to the sub-sample of firms that did not apply for a loan (31,326 observations), the distribution of firm dimension is very similar to that of the overall sample. Two thirds of these firms showed a decreasing or stable turnover during the period considered and only 28% of them had an increase in profit. In terms of financing, firms relied on trade credit and leasing. In the case of the subsample of enterprises that applied for a loan (10,647 observations), the distribution is slightly different with respect to the overall sample and loan application propensity seems to be relatively higher for larger firms. Almost two thirds of these firms had an increasing or stable turnover, while more than 47% of them faced a reduction in profit. In terms of financing, they tend to rely heavily on leasing and trade credit (44% and 45% respectively). The indicator for female top manager is negatively correlated to the credit obtained dummy (Person correlation coefficient of -.0050), however this relationship is not statistically significant. On the other hand, the female dummy is associated strongly and significantly



(correlation = +.0232) to the binary variable indicating refusal to apply for a loan due to anticipated bank rejection.

The statistics for the two groups suggest some differences. The subsample of non-applicants is characterized by a larger proportion of smaller and micro firms compared to the subsample of applicants. This is perfectly logical, since smaller firms typically need less finance and are therefore less dependent on bank debt. Interestingly, and somewhat unexpectedly, the two groups are very similar in terms of age and profit changes. Firms that file for a loan tend to grow in terms of turnover, while the opposite is true for the enterprises that do not seek bank credit. As far as gender is concerned, in the sub-sample that considers loan applicants only 10% of the firms are managed by women. In the case of firms that did not apply for a loan, this percentage is higher and stands at 13%. Although this may suggest that female managers are less likely to apply for a loan than their male counterparts, more detailed analysis is needed before arriving at any definite conclusion.

## **6. Empirical Results**

### ***6.1. Loan Application***

Table 3 presents logit regressions where the dependent variable indicates whether the enterprise has applied for a bank loan. Three different specifications are reported. The first regression incorporates all controls and semester dummies, the second extends the modeling by allowing for country dummies, while the last one is a parsimonious specification excluding regressors that are both consistently insignificant and inconsequential for the R-squared. The estimations are based on 41,973 observations and correctly classify nearly three quarters of the observations. Importantly, the null hypothesis that the explanatory variables are jointly unable to explain the underlying process is strongly rejected and the  $p$ -values for the corresponding  $\chi^2$  statistics are indistinguishable from zero. The McFadden's pseudo R-squared, which is based on the likelihood ratio index, varies in our regressions between 5.30% to 6.34%. This level of the explanatory power reflects the fact that the decisions of the entrepreneurs are not purely

mechanistic and may be also driven by behavioural factors.

[TABLE 3 ABOUT HERE]

The reported regressions suggest that firms run by female managers are less likely to file a loan application, which supports our first hypothesis. This finding is statistically significant at the 1% level and the odds that a woman will apply are *ceteris paribus* less than 90% of the male equivalent. Judging from the marginal effects, the gender differences in application probability amount to around two percentage points. One needs to bear in mind that the regressions already take into account country- and firm-specific characteristics. Consequently, we can rule out these factors as the *raison d'être* of the observed gender differences. Our findings contrast with those in Cavalluzzo and Cavalluzzo (1998) who do not find any significant differences in application rates across gender in the US, but are in line with the results from Zimbabwe suggesting that it is men who are more likely to want loans (Raturi and Swamy, 1999).

With regard to the control variables, the probability of application increases with firm size. Large enterprises have more wide-ranging operations and therefore, at any point in time, will be more likely to require bank financing. The variable measuring 'independence' bears a positive coefficient, highlighting the fact that firms unlinked to groups are freer to use debt finance and cannot rely on internal finance provided by the holding company. Expanding enterprises that are experiencing turnover growth have greater financing needs, and thus a positive relationship with loan application. At the same time, those that are profitable can finance their development from retained earnings and are thus less likely to apply. Overall, class age is not a strong determinant in the regressions, although older businesses are marginally less willing to borrow possibly due to a more consolidated financial position. The results are also consistent with businesses using different sources of finance jointly, as evidenced by the positive influence of the financial structure variables.

Among the financial and economic context variables, it is the degree of bank concentration that exerts the strongest and most consistent effect on application probability. It reduces the desire

of firms to apply for credit, as a lower degree of competition reflects inability to shop around, leading to worse contractual terms for the borrower. The directional impact of national unemployment depends on whether the regression controls for time invariant country dummies.

## **6.2. *Rejection Expectations***

In this section we examine whether gender affects managers' decisions to not apply for a loan because of anticipated rejection. The dependent variable takes the value of 1 if application avoidance was attributed to a self-reported managerial expectation of being turned down and 0 otherwise. Since the rationale for this approach is to better understand the reason behind non-submission, we restrict our sample to non-applicant firms only (31,326 observations). Table 4 reports the estimated parameters and goodness of fit measures for three different specifications. Similarly to the previous section, these specifications differ in whether they include country dummies as well as the full set of explanatory variables. The good fit is validated by the  $\chi^2$  test for joint significance and our models correctly classify around 91% of the observations. The pseudo R-squared varies between 4.67% and 6.33%.

[TABLE 4 ABOUT HERE]

Female managers presuppose loan denial more often and self-reject as a result, which is in line with our second hypothesis. When evaluating all of the regressions reported in Table 4, one can conclude that the odds that a female-led firm will not apply due to an anticipated negative outcome are around 12% to 14% higher than the odds for a male comparator. From the point of view of marginal effects, the gender difference in likelihood of being discouraged borrower is nearly one percentage point. This difference maintains its statistical significance regardless of the modeling approach. Extant literature offers only very limited evidence on the link between female doubt about future loan approval and the decision to self-exclude. By focusing on US small business owners, Cavalluzzo et al. (2002) found no evidence that women, on average, have a higher propensity to be discouraged borrowers, even if in markets with high lender concentration the female fear of rejection started to manifest and become more prominent. Our estimates

obtained for a different geographical region and time period do not seem to be entirely congruous with those earlier findings.

Looking at the estimated coefficients on the control variables, we discover that larger firms are more confident in approaching banks. They need more financing and are also aware that due to their relative economic soundness and higher degree of diversification, their perceived bankruptcy risk is lower. Independent enterprises fear rejection more strongly, as their position in negotiation with the lender is weaker and they cannot rely on a holding company for loan guarantees. Since profitability is typically one of the screening criteria employed by banks, profitable firms feel less concerned about potential negative outcomes. Businesses that are less established and younger (less than 9 years old) are aware that they are affected by a higher level of information asymmetry and thus exhibit a stronger inclination towards self-exclusion. With the exception of retained earnings, the use of alternative sources of finance is significantly and positively associated with the dependent variable. Greater use of trade credit or leasing may undermine ability to meet future interest and principal repayments and firms seem to be afraid of this eventuality.

Four more explanatory variables are consistently signed and statistically significant across all specifications. First, a banking system that is burdened with bad loans tightens the lending standards. In such case, entrepreneurs would encounter more difficulties in obtaining credit and some may decide not to apply in order to avoid disappointment. On the other hand, laxer lending practices associated with credit expansions alleviate the fear of possible application rejection (note that CREDIT\_ACCESS takes negative values when banks expand credit). Managers also appear to be particularly concerned with the possibility of negative evaluation by a financial intermediary in the difficult times of high unemployment. Finally, the coefficients on Herfindahl-Hirschman index of bank concentration are significantly negative. It is conceivable that in markets with few large banks, lending relationships are more established and informational asymmetries smaller, resulting in reduced angst on the part of borrowers.

### ***6.3. Loan Denials***

In this section we examine the determinants of rejection in the loan application process. Table 5 reports the results of logistic regressions where the dependent variable takes the value of 1 if the firm has been turned down by a financial institution and 0 otherwise. The sample for this analysis is restricted to the enterprises that have actually applied, resulting in a sample size of 10,647 observations. Similarly to the previous sections, we consider three differing specifications in the set of explanatory variables included. The models have reasonable explanatory power and correctly classify over 88% of the observations. The  $\chi^2$  test for the joint significance of the regressors strongly rejects the null hypothesis of no influence and the McFadden's pseudo R-squares vary between 8.02% and 9.31%. These R-squares are slightly lower, but comparable, to those reported in Muravyev et al. (2009) for similar regressions estimated using international data.

[TABLE 5 ABOUT HERE]

Even though the coefficients on women manager dummy are positive, we do not find any statistically significant evidence of gender-based discrimination and have to reject our third hypothesis. The evidence suggests that banks are objective when evaluating requests for credit. This finding is not entirely surprising, considering the argument proposed by Becker (1971) that engaging in discrimination leads to financial losses to the perpetrator. Although our finding supports the earlier results obtained from the US data (Blanchflower et al., 2003; Cavalluzzo and Cavalluzzo, 1998; Cavalluzzo and Wolken, 2005), it is incompatible with the conclusions reached by Muravyev et al. (2009), who argue that discrimination in the banking sector is present.

Considering other regressors, we note that firm size exhibits an inverse relationship with rejection rates. This nexus can be easily explained, as it has been shown that small businesses have a higher probability of bankruptcy (Shumway 2001). Banks also prefer to grant loans to growing and profitable enterprises, as these are more likely to honor their future obligations. When evaluating the coefficients on age dummies, one needs to bear in mind that firms older than 9 years have been taken as a benchmark. All of the younger firm groups face higher rejection rates and, for most of them, this finding is statistically significant. Interestingly, the use of leasing and trade

credit is associated positively with the likelihood of getting a loan. Presumably lessors and trading partners have already evaluated the creditworthiness of the enterprise and deemed it to be satisfactory. The analysis performed by banks seems to reconfirm this. Loan denial rates also tend to fluctuate with general macroeconomic and financial conditions, decreasing in times of economic prosperity, credit expansions and healthy banking system. Big government deficits increase loan rejection probability, as banks may choose to lend to the public rather than private sector. Finally, there is weak evidence that more concentrated banking systems tend to turn down applications more often.

## **7. Robustness Checks and Further Considerations**

In what follows, we examine whether our results are robust to bank concentration, selection bias as well as firm's quality.

### ***7.1 Bank Concentration and Discrimination***

The first robustness check we perform examines the role of the concentration of the banking industry. Becker (1971) argues that, on average, competitive environments are expected to discriminate less than monopolistic ones. This happens because prejudicial discrimination is a counter-productive activity, since it reduces net incomes of the group that is being discriminated against, as well as the group that perpetrates the discrimination. A bank that engages in discrimination will have to forfeit a fraction of deals for which the marginal benefit exceeds the marginal cost, leading to a reduction in profits. In a highly competitive environment, forfeiting income on unproductive activities will prove unaffordable and may quickly lead to the perpetrator's demise. At the same time, banks that face reduced competition could sustain discriminatory practices for prolonged periods of time without going bankrupt. Cavalluzzo et al. (2002) find empirical evidence that denial rates for female-owned firms in the US depend on lender concentration.

In fact, we have already controlled for bank concentration by considering the Herfindahl-Hirschman index for the banking sector in a given country. However, in order to gain a clearer

understanding of the effect that bank sector concentration has on female-run firms' credit access, we re-estimated the regressions by entering a new variable, namely the interaction of gender with the Herfindahl-Hirschman index by simultaneously dropping the HHI from the list of control variables. In such specifications, the coefficient in front of the gender dummy captures the across-group differentials that can arise from a variety of sources (namely statistical discrimination and prejudicial discrimination) that we expect to be invariant to market structure. The interaction variable should capture any gender discrimination that can be ascribed to a lender's market power in the firm's local area. Wider differentials in less competitive lending markets are consistent with taste-based discrimination, as posited by Becker (1971). The results (not reported here) show that the interaction variable is not significant, which means that we can rule out any discrimination that is driven purely by market concentration.

### ***7.2 Using Heckman Sample Selection Model***

The second robustness check investigates whether our results are affected by sample selection. As explained in the methodology section, we have used different subsamples and consequently our results might potentially be affected by sample selection bias. In order to deal with this issue, we re-estimated the regressions by relying on Heckman sample selection model (Heckman, 1979). We modeled the selection process by relying on a categorical variable that measures the firms' need for additional finance and also acts as our selection equation instrument. The results (not reported) were obtained by using a Heckman probit estimation. With regard to our models for discouraged borrowers, our main conclusions were maintained and there were no changes in the direction of influence of the gender dummy: female managers are more likely to self-exclude from the application process due to expected rejection; the gender variable is not significant in the loan rejection, suggesting that enterprises managed by women are not discriminated by banks. Consequently, our conclusions are robust to selection bias issues.

### ***7.3 Gender and Firm Creditworthiness***

It can be argued that the fact that women are more likely to be discouraged borrowers

could be potentially rooted in the relatively high riskiness of their firms. If they are aware of this, it is perfectly rational for them to avoid submitting loan applications because of the expected rejection. Unfortunately, the dataset we use in our analysis does not provide detailed information on income statement or balance sheet items, which makes it impossible to construct risk measures akin to Altman Z-scores (Altman, 1968), that could be used in the regression as additional controls. In order to address this potential issue we implement two additional robustness checks.

Firstly, we replicate the SAFE database by extracting a stratified sample of firms from the Bureau van Dijk Dataset – ORBIS. The replicated sample matches the characteristics of the original one in terms of firms' age and turnover classes, distribution across countries and industries, and the proportion of women in top management positions. This parallel dataset, containing 13,038 observations, is used to examine whether there are significant differences in terms of creditworthiness between women- and men-run firms. We rely on the ratios suggested by Altman for small enterprises. More specifically, we consider: Earnings Before Interest and Taxes (EBIT) / Total Assets; EBIT / Long-Term Loans; and Sales / Total Assets. At the same time, we have to drop Book Value of Equity / Total Liabilities and (Current Assets – Current Liabilities) / Total Assets, because of the lack of data in the ORBIS dataset. We test whether the average values of the considered ratios are significantly different between enterprises managed by men and women and re-tested the ratios at country level and by firm dimension class. The results we obtain are very interesting in that none of the tests indicated any statistically significant differences across genders. In other words, the fear of rejection by banks exhibited by female managers should not be attributed to the riskiness of their firms.

Secondly, we try to exploit SAFE dataset by using the general information contained therein to construct a crude credit score. To this end, we rely on a set of dimensions, namely a dummy variable indicating whether the firm belongs to a group (an independent firm is higher risk than a firm that belongs to a group); the age of the firm (younger firms are more risky since they have not established a track record that proves their capability to survive); whether the firm is



growing in terms of turnover (growing firms are considered more solid than declining ones); and whether the firms are profitable (profitable firms are lower risk than loss making ones). We numbered the age classes from 1 (the youngest) to 4 (the oldest) and did the same for the turnover classes (1 = smallest; 4 = biggest). In the case of change in turnover or change in profit the values are 0 (decrease), 1 (no change), 2 (increase). Then we sum these values for each firm obtaining a scale that ranges from 0 to 13.

We then include the credit score as a control in our regressions and simultaneously exclude its components from the list of explanatory variables in order to avoid multicollinearity issues (interestingly enough, the conclusions remain unaltered even if the components are included). If firms led by women are characterized by higher risk, then including our measure could render the WOMEN not significant in the discouraged borrowers regression. This however is not the case as shown by the results reported in Tables 6, 7 and 8 that reinforce our earlier findings regarding all hypotheses tested in our work.

[TABLES 6, 7 AND 8 ABOUT HERE]

#### ***7.4 Additional Tests***

We also run additional econometric robustness checks, but do not report the results here in order to conserve space. Firstly, we re-estimate the regressions using the probit approach and find that there is no change in the significance and sign of the variables in general and gender in particular. Secondly, we also re-estimate coefficient standard errors by employing a bootstrap method (Efron and Tibshirani 1998) and again find no major deviations in terms of significance from our initial specifications. Thirdly, we included cultural variables into our models (Hofstede, 1983, 1981). The incorporation of cultural regressors did not change the main conclusions of this study. However, our final specifications do not contain these Hofstede's measures of culture, as they are time-invariant and, their inclusion leads to multicollinearity problems.

#### ***7.5 Further Considerations***

Our robustness checks suggest that the original findings are robust to sample selection, the

effect of competition, the creditworthiness of the firm as well as different estimation techniques. Thus, we can conclude that, in Europe, female-led firms are less likely to apply for a loan compared to male-led ones, chiefly because female managers are more inclined to be discouraged borrowers.

Several possible justifications can be offered for these empirical regularities. Firstly, female managers could be less confident in their ability to run the business and consequently be more conservative when contemplating bank loans. Secondly, they could also have an erroneous belief that the financial institutions are biased against them and avoid applying in order to save time and avoid distress. Third, we cannot rule out that application propensity could be also linked to differential psychological traits such as confidence or emotional reactions to being turned down. At the same time, our additional tests on the quality of female run firms undermine the explanation that the results could be attributable to gender-linked risk differentials.

Interestingly, when lender decisions are examined, gender does not affect the probability of the loan application being turned down (rejection of H3). Financial intermediaries seem to engage neither in statistical nor in prejudicial discrimination. This observation could be the result of lenders' attitudes towards gender-related issues, but it could also derive from the increasing adoption of a transaction lending approach, which leverages firms' facts, figures and the quality of management, thereby constraining loan managers' prejudicial discriminatory behavior. The implementation of Basel II and Basel III agreements has promoted the use of transaction lending (mainly credit scoring and credit rating techniques), which may have contributed to reducing gender bias. Interestingly, transaction lending does not necessarily limit the possibility of statistical discrimination, since credit evaluation algorithms used by banks may consider gender. However, even if this variable is included in algorithms our findings indicate that it plays a very minor role.

The results reported here cohere with some of the earlier empirical studies, but not with all of them. For instance, we find that banks do not discriminate against female entrepreneurs and this

is at odds with the work by Bellucci et al. (2010). Some of the previous research, however, can be affected by specific local aspects, such as regulation or national culture (e.g. Bellucci et al. (2010) focused solely on Italy, while Cavalluzzo and Cavalluzzo (1998) examined only the US). Ours, on the other hand, is a multi-country examination, which attempts to control for local context. In addition, we use very recent observations that are affected by the implementation of new banking regulations - the Basel II and Basel III agreements. As outlined above, these regulations may affect the way in which banks operationalize their decision-making, which may affect their attitudes towards different groups.

## **8. Conclusions**

Our research investigates the role of gender in accessing credit in Europe by exploiting a very recent dataset produced by the European Central Bank. The results indicate that female-led firms are less likely to apply for a loan compared to enterprises run by men. This happens because women managers are reluctant to file a loan application since they anticipate rejection on the part of the lender. At the same time, we find no evidence that, in the process of arriving at their final lending decision, financial institutions discriminate against firms based on the gender of their management. These findings are intriguing, since they indicate that, irrespective of governmental regulation and banks' non-discriminatory policies, enterprises run by females may still end up being unnecessarily credit constrained.

Some of the inferences we make are consistent with part of the existing body of literature - for instance, the absence of gender-based bias in loan denial rates was also noted in the US by several scholars (Cavalluzzo and Cavalluzzo 1998; Cavalluzzo et al. 2002; Blanchflower et al. 2003). However, they are at variance with Bellucci et al. (2010) and Muravyev et al. (2009) who argue that bank discriminatory practices do in fact exist or with Cavalluzzo et al. (2002) who find that women, on average, are not more inclined to engage in application avoidance due to the fear of rejection. Our results highlight the fact that any overgeneralizations regarding discrimination and behavior of female managers can be dangerous and may be potentially misleading.

Apparently, conclusions can be dependent upon the dynamic regulatory context or country-specific factors.

Our study has several important implications. First, we cannot rule out women self-exclude due to their perception that banks will discriminate against their gender. This interpretation implies that even if legislators and regulators have addressed prejudicial gender discrimination directly and indirectly (as in the case of Basel agreements), they were unable to solve this problem completely. Indeed, consolidated opinions, biased evaluations, as well as established cultural frameworks that affect gender discrimination are not easy to overcome. Both financial institutions and legislators should exert additional effort in order to eliminate any residual and perceived (but absent) discrimination. If female application avoidance stems from concern about being discriminated against, then the outcome of their behavior will be socially suboptimal since firms can be constrained in their growth. Inhibited expansion of firms, in turn, implies foregoing valuable employment opportunities.

A second but related point is that female managers should be careful to ensure that any unjustified concerns do not lead to a situation in which their firms become severely credit constrained. Low self-confidence in their ability to run the business can adversely affect their decision to apply for a loan and consequently reduce the firm's growth potential. Furthermore, it is in the best interest of financial institutions to ensure that women are fully aware of the absence of gender bias in their lending decisions. If female self-exclusion is attributable to fear of rejection, this will potentially imply missed lending opportunities to creditworthy firms that are capable of repaying interest and principal. Through their marketing communications, banks should endeavor to alleviate the concerns of female managers in order to stimulate their application propensity. In this way, financial intermediaries may be able to access a new untapped segment of the market.

Our research also has some limitations, which cannot be easily overcome. Firstly, due to the fact that SAFE incorporates only limited information on the financial standing of the firms, controlling for creditworthiness is a rather difficult task. Even if the results of additional tests

involving internal raw credit score and parallel dataset support our findings, we cannot categorically rule out the possibility that female self-exclusion is completely unrelated to the quality of their companies. Future research based on European data should endeavor to incorporate better credit risk measures and further explore the differences between female and male run firms. Secondly, we rely solely on European data, which leaves us with the unanswered question of whether the conclusions are continent-specific. A third limitation is that, because of the use of unmatched panel dataset, we are unable to track the evolution of lending and borrowing decisions through time. Notwithstanding the above mentioned limitations, this study expands our understanding of how gender interacts with credit supply and demand, as well as identifies areas for improvement that could be beneficial for wider society.

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**Table 1: Descriptive Statistics**

This table presents variable definitions and their source.

Variable	Definition	Source
BANK_LOAN_APPLICATION	Did the firm applied for a bank loan over the past 6 months (yes=1, no=0)	SAFE, ECB
REJECTION_EXPECTED	Did the firm not apply for a loan because of anticipated rejection (yes=1, no=0)	SAFE, ECB
LOAN_REJECTED	Was the loan application made by the firm rejected (yes=1, no=0)	SAFE, ECB
WOMEN	Gender of the owner/director/CEO of the firm (female=1, man=0)	SAFE, ECB
MICRO	Size dummy taking the value of 1 if the company has from 1 to 9 paid employees working over 12 hours a week.	SAFE, ECB
SMALL	Size dummy indicating companies with 10 to 49 paid employees working over 12 hours a week.	SAFE, ECB
MEDIUM	Size dummy taking the value of 1 for companies with 50 to 249 paid employees working more than 12 hours weekly.	SAFE, ECB
INDEPENDENT	Dummy variable taking a value of 1 for independent firms and 0 for firms that are a part of a group.	SAFE, ECB
CHANGE_TURNOVER	Categorical variable dependent on the change in turnover over the last 6 months (increase=1, unchanged = 0, decrease=-1).	SAFE, ECB
CHANGE_PROFIT	Change in net income after taxes over the last 6 months (increase=1, unchanged = 0, decrease=-1).	SAFE, ECB
<2YEARS	Age dummy (companies younger than 2 years=1, otherwise=0)	SAFE, ECB
2_5YEARS	Age dummy (companies between 2 and 5 years old =1, otherwise=0)	SAFE, ECB
5_9YEARS	Age dummy (companies older than 5 years, but less than 10 years=1, otherwise=0)	SAFE, ECB
RETAINED_EARNINGS	Financing dummy (1 if retained earnings or sale of assets was used in the past 6 months, 0 otherwise)	SAFE, ECB
TRADE_CREDIT	Financing dummy (1 if trade credit was used in the past 6 months, 0 otherwise)	SAFE, ECB
LEASING	Financing dummy (1 if leasing, hire-purchase or factoring was used in the past 6 months, 0 otherwise)	SAFE, ECB
EQUITY	Financing dummy (1 if new equity was used in the past 6 months, 0 otherwise)	SAFE, ECB
GDP_GROWTH	Percentage change in the GDP	Eurostat
INFLATION	Annual inflation rate	Eurostat
UNEMPLOYMENT	Annual unemployment rate	Eurostat
CASH_SURPL_DEFICIT	Government cash surplus/deficit divided by GDP [in percentage points]	WDI,
NON_PERF	Bank nonperforming loans to total gross loans [in percentage points]	WDI
CREDIT_ACCESS	Index representing the propensity of the bank system of a country to lend to borrowers	ECB
HHI	Herfindahl-Hirschman index of bank concentration	ECB

**Table 2: Descriptive Statistics**

This table presents summary statistics for the variables used in the study. The overall sample and two sub-samples are considered. For exact variable definitions please refer to Table 1. Sig.: \*\*\* <.01, \*\* <.05, \* <.10

	Overall dataset					Application submitted					Application not submitted				
	for the analysis about credit application					for the analysis of credit rejection and partial rejection					for the analysis of rejection expected (self selection)				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
BANK_LOAN_APPLICATION REJECTION_EXPECTED LOAN_REJECTED	41973	0.254	0.170	0	1	10647	0.118	0.322	0	1	31326	0.086	0.281	0	1
MICRO	41973	0.331	0.471	0	1	10647	0.237	0.425	0	1	31326	0.363	0.481	0	1
SMALL	41973	0.338	0.473	0	1	10647	0.342	0.474	0	1	31326	0.337	0.473	0	1
MEDIUM	41973	0.258	0.438	0	1	10647	0.317	0.466	0	1	31326	0.238	0.426	0	1
LARGE	41973	0.072	0.259	0	1	10647	0.104	0.305	0	1	31326	0.062	0.241	0	1
INDEPENDENT	41973	0.758	0.428	0	1	10647	0.784	0.411	0	1	31326	0.749	0.434	0	1
CHANGE_TURNOVER	41973	-0.008	0.846	-1	1	10647	0.013	0.849	-1	1	31326	-0.016	0.839	-1	1
CHANGE_PROFIT	41973	-0.157	0.840	-1	1	10647	-0.185	0.843	-1	1	31326	-0.148	0.836	-1	1
<2YEARS	41973	0.017	0.130	0	1	10647	0.017	0.129	0	1	31326	0.018	0.131	0	1
2_5YEARS	41973	0.075	0.260	0	1	10647	0.073	0.260	0	1	31326	0.076	0.265	0	1
5_9YEARS	41973	0.132	0.339	0	1	10647	0.119	0.324	0	1	31326	0.137	0.344	0	1
>9YEARS	41973	0.778	0.416	0	1	10647	0.801	0.399	0	1	31326	0.770	0.421	0	1
RETAINED_EARNINGS	41973	0.298	0.457	0	1	10647	0.339	0.474	0	1	31326	0.284	0.451	0	1
TRADE_CREDIT	41973	0.361	0.480	0	1	10647	0.453	0.498	0	1	31326	0.330	0.470	0	1
LEASING	41973	0.347	0.476	0	1	10647	0.440	0.496	0	1	31326	0.315	0.465	0	1
EQUITY	41973	0.067	0.250	0	1	10647	0.082	0.274	0	1	31326	0.062	0.241	0	1
CREDIT_ACCESS	41973	4.080	9.555	-14.00	60.00	10647	3.491	8.529	-14.00	60.00	31326	4.280	9.872	-14.00	60.00
CASH_SURPL_DEFICIT	41973	-5.304	4.522	-29.20	0.14	10647	-5.298	3.905	-29.20	0.14	31326	-5.306	4.713	-29.20	0.14
NON_PERF	41973	6.075	4.629	0.38	24.99	10647	6.161	4.205	0.38	24.99	31326	6.045	4.764	0.38	24.99
GDP_GROWTH	41973	-0.078	2.706	-8.50	4.00	10647	-0.276	2.714	-8.50	4.00	31326	-0.011	2.700	-8.50	4.00
INFLATION	41973	2.118	1.095	-1.70	4.70	10647	2.122	1.091	-1.70	4.70	31326	2.116	1.097	-1.70	4.70
UNEMPLOYMENT	41973	11.153	5.938	3.60	25.70	10647	11.772	6.023	3.60	25.70	31326	10.943	5.894	3.60	25.70
HHI	41973	0.091	0.079	0.02	0.37	10647	0.078	0.065	0.02	0.37	31326	0.095	0.082	0.02	0.37
WOMEN	41973	0.12	0.33	0	1	10647	0.103	0.304	0	1	31326	0.131	0.337	0.00	1.00

**Table 3: Modelling Loan Application**

This table presents results of three logistics regressions where the dummy for loan application is the dependent variable. The explanatory variables are defined in Table1. Sig.: \*\*\* <.01, \*\* <.05, \* <.10

VARIABLES	Model 1 Loan Application Basic regression				Model 2 Loan Application Regression with country dummies				Model 3 Loan Application Parsimonious model			
	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects
MICRO	-0.701***	0.047	0.496	-0.119	-0.659***	0.048	0.517	-0.111	-0.673***	0.047	0.51	-0.114
SMALL	-0.368***	0.045	0.692	-0.065	-0.334***	0.045	0.716	-0.058	-0.340***	0.045	0.712	-0.059
MEDIUM	-0.191***	0.045	0.826	-0.034	-0.170***	0.045	0.844	-0.030	-0.172***	0.045	0.842	-0.030
INDEPENDENT	0.464***	0.037	1.59	0.079	0.464***	0.037	1.591	0.078	0.466***	0.037	1.593	0.078
CHANGE_TURNOVER	0.112***	0.017	1.118	0.020	0.107***	0.017	1.113	0.019	0.106***	0.017	1.112	0.019
CHANGE_PROFIT	-0.119***	0.018	0.888	-0.022	-0.107***	0.018	0.899	-0.019	-0.107***	0.018	0.899	-0.019
<2YEARS	0.079	0.092	1.082	0.015	0.054	0.093	1.056	0.010				
2_5YEARS	-0.069	0.048	0.934	-0.012	-0.077	0.048	0.926	-0.014				
5_9YEARS	-0.052	0.036	0.949	-0.009	-0.064*	0.036	0.938	-0.011				
RETEINED_EARNINGS	0.117***	0.026	1.125	0.022	0.171***	0.027	1.186	0.031	0.173***	0.027	1.188	0.032
TRADE_CREDIT	0.470***	0.025	1.599	0.088	0.474***	0.026	1.607	0.088	0.475***	0.026	1.608	0.088
LEASING	0.404***	0.025	1.498	0.076	0.450***	0.025	1.568	0.084	0.448***	0.025	1.565	0.083
EQUITY	0.213***	0.045	1.237	0.041	0.257***	0.045	1.293	0.049	0.256***	0.045	1.292	0.049
WAVES	Included				Included				Included			
COUNTRIES					Included				Included			
CASH_SURPL_DEFICIT	-0.001	0.004	1.000	-0.000	-0.001	0.007	0.999	-0.000	-0.001	0.007	0.999	-0.000
NON_PERF	-0.018***	0.004	0.982	-0.003	-0.010	0.012	0.990	-0.002	-0.010	0.012	0.990	-0.002
CREDIT_ACCESS	-0.002	0.001	0.998	-0.001	0.003	0.002	1.003	0.001	0.003	0.002	1.003	0.001
GDP_GROWTH	-0.030***	0.008	0.971	-0.005	-0.016	0.012	0.984	-0.003	-0.016	0.012	0.985	-0.003
INFLATION	0.179***	0.019	1.196	0.033	-0.002	0.024	0.998	-0.001	-0.001	0.024	0.999	-0.001
UNEMPLOYMENT	0.021***	0.002	1.022	0.004	-0.036***	0.013	0.964	-0.007	-0.036***	0.013	0.965	-0.006
HHI	-3.495***	0.192	0.030	-0.635	-4.157***	1.589	0.016	-0.747	-4.099***	1.589	0.017	-0.737
WOMEN	-0.117***	0.038	0.889	-0.021	-0.110***	0.038	0.896	-0.019	-0.112***	0.038	0.894	-0.020
CONSTANT	-1.819***	0.092	0.162		-0.790***	0.237	0.454		-0.809***	0.237	0.445	
Observations	41,973				41,973				41,973			
chi2	2520.0				3013.0				3008.0			
p	0.0000				0.0000				0.0000			
R2	0.0530				0.0634				0.0633			

**Table 4: Modeling Discouraged Borrowers**

This table presents three logistics regressions in which the dependent variable is a dummy identifying discouraged borrowers. The explanatory variables are defined in Table1. Sig.: \*\*\* <.01, \*\* <.05, \* <.10

VARIABLES	Model 1 Discouraged Borrower Basic regression				Model 2 Discouraged Borrower Regression with country dummies				Model 3 Discouraged Borrower Parsimonious model			
	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects
MICRO	0.859***	0.115	2.360	0.068	0.884***	0.116	2.420	0.065	0.882***	0.115	2.416	0.064
SMALL	0.496***	0.115	1.641	0.037	0.508***	0.115	1.663	0.037	0.508***	0.115	1.661	0.035
MEDIUM	0.249**	0.118	1.283	0.019	0.252**	0.119	1.287	0.017	0.252**	0.119	1.287	0.017
INDEPENDENT	0.195***	0.067	1.215	0.013	0.217***	0.067	1.243	0.014	0.218***	0.067	1.243	0.013
CHANGE_TURNOVER	0.016	0.032	1.016	0.001	0.014	0.032	1.015	0.001				
CHANGE_PROFIT	-0.114***	0.033	0.893	-0.008	-0.124***	0.033	0.883	-0.008	-0.115***	0.027	0.892	-0.007
<2YEARS	0.414***	0.140	1.513	0.034	0.358**	0.142	1.430	0.027	0.360**	0.142	1.434	0.027
2_5YEARS	0.531***	0.068	1.701	0.045	0.477***	0.069	1.612	0.037	0.479***	0.069	1.614	0.037
5_9YEARS	0.240***	0.057	1.271	0.018	0.224***	0.058	1.251	0.016	0.225***	0.058	1.252	0.015
RETAINED_EARNINGS	-0.001	0.048	0.999	0.000	0.036	0.049	1.036	-0.002	0.036	0.049	1.036	-0.002
TRADE_CREDIT	0.274***	0.045	1.316	0.020	0.333***	0.046	1.395	0.023	0.333***	0.046	1.396	0.023
LEASING	0.104**	0.047	1.110	0.007	0.105**	0.048	1.110	0.007	0.105**	0.048	1.111	0.007
EQUITY	0.385***	0.080	1.469	0.031	0.344***	0.081	1.411	0.026	0.344***	0.081	1.411	0.026
WAVES	Included				Included				Included			
COUNTRIES					Included				Included			
CASH_SURPL_DEFICIT	-0.023***	0.005	0.977	0.002	-0.010	0.009	0.990	-0.001	-0.010	0.009	0.990	-0.001
NON_PERF	0.028***	0.006	1.029	0.002	0.032**	0.016	1.032	0.002	0.032**	0.016	1.032	0.002
CREDIT_ACCESS	0.009***	0.002	1.009	0.001	0.009***	0.003	1.009	0.001	0.009***	0.003	1.009	0.001
GDP_GROWTH	-0.006	0.012	0.994	-0.001	0.035**	0.018	1.036	0.002	0.035**	0.018	1.036	0.002
INFLATION	-0.045	0.031	0.956	-0.003	0.109***	0.039	1.115	0.007	0.109***	0.039	1.115	0.007
UNEMPLOYMENT	0.030***	0.004	1.031	0.002	0.106***	0.021	1.112	0.007	0.106***	0.021	1.112	0.007
HHI	-1.610***	0.339	0.200	-0.113	-8.791**	3.542	0.001	-0.570	-8.824**	3.541	0.001	-0.572
WOMEN	0.115**	0.058	1.121	0.008	0.134**	0.058	1.144	0.009	0.134**	0.058	1.143	0.009
CONSTANT	-3.966***	0.181	0.019		-4.934***	0.500	0.007		-4.930***	0.500	0.007	
Observations	31,326				31,326				31,326			
chi2	862.1				1166.0				1166.0			
p	0.0000				0.0000				0.0000			
R2	0.0468				0.0633				0.0633			

**Table 5: Modelling Bank Loan Rejection**

This table presents three logistics regressions in which the dependent variable is a dummy that defines whether the loan has been rejected (conditional on applying). The explanatory are defined in Table 1. Sig.: \*\*\* <.01, \*\* <.05, \* <.10

VARIABLES	Model 1 Rejected Basic Regression				Model 2 Rejected Regression with country dummies				Model 3 Rejected Parsimonious model			
	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects
MICRO	1.452***	0.161	4.272	0.175	1.482***	0.163	4.403	0.173	1.486***	0.162	4.419	0.174
SMALL	0.870***	0.159	2.386	0.086	0.905***	0.160	2.473	0.087	0.907***	0.160	2.478	0.087
MEDIUM	0.595***	0.161	1.812	0.057	0.617***	0.162	1.853	0.057	0.618***	0.162	1.855	0.057
INDEPENDENT	-0.022	0.122	0.978	-0.002	0.030	0.123	1.031	0.003				
CHANGE_TURNOVER	-0.074*	0.045	0.928	-0.007	-0.058	0.045	0.944	-0.005	-0.058	0.045	0.944	-0.005
CHANGE_PROFIT	-0.090*	0.049	0.914	-0.008	-0.093*	0.050	0.911	-0.008	-0.094*	0.050	0.910	-0.008
<2YEARS	0.230	0.225	1.258	0.022	0.259	0.228	1.296	0.024	0.253	0.228	1.289	0.024
2_5YEARS	0.726***	0.107	2.067	0.082	0.686***	0.109	1.985	0.074	0.684***	0.109	1.981	0.073
5_9YEARS	0.421***	0.087	1.524	0.042	0.424***	0.088	1.529	0.041	0.426***	0.088	1.531	0.041
RETAINED_EARNINGS	0.0613	0.069	1.063	0.005	0.068	0.070	1.071	0.006	0.068	0.070	1.070	0.006
TRADE_CREDIT	-0.094	0.066	0.910	-0.008	-0.125*	0.067	0.883	-0.010	-0.125*	0.067	0.882	-0.011
LEASING	-0.156**	0.069	0.856	-0.014	-0.171**	0.069	0.843	-0.014	-0.171**	0.069	0.842	-0.014
EQUITY	0.037	0.124	1.037	0.003	0.090	0.126	1.095	0.008	0.089	0.126	1.093	0.008
WAVES	Included				Included				Included			
COUNTRIES					Included				Included			
CASH_SURPL_DEFICIT	-0.032***	0.009	0.968	0.003	-0.036**	0.016	0.965	0.003	-0.039**	0.015	0.962	0.003
NON_PERF	0.030***	0.010	1.03	0.003	0.090***	0.027	1.095	0.008	0.091***	0.027	1.095	0.008
CREDIT_ACCESS	0.010**	0.004	1.01	0.001	0.014**	0.006	1.014	0.001	0.014**	0.006	1.014	0.001
GDP_GROWTH	-0.073***	0.019	0.93	-0.006	-0.106***	0.030	0.899	-0.009	-0.102***	0.029	0.903	-0.009
INFLATION	-0.056	0.047	0.946	-0.005	-0.046	0.058	0.955	-0.004				
UNEMPLOYMENT	0.023***	0.006	1.023	0.002	-0.017	0.033	0.983	-0.001	-0.008	0.031	0.992	-0.001
HHI	0.349	0.601	1.417	0.031	-15.860***	5.590	0.000	-1.334	-15.630***	5.572	0.000	-1.315
WOMEN	0.049	0.097	1.050	0.004	0.056	0.097	1.057	0.005	0.056	0.097	1.057	0.005
CONSTANT	-3.795***	0.287	0.023		-2.329***	0.751	0.097		-2.612***	0.635	0.073	
Observations	10,647				10,647				10,647			
chi2	619.0				718.2				717.5			
p	0.0000				0.0000				0.0000			
R2	0.0802				0.0931				0.0930			

**Table 6: Modelling Loan Application with Borrower Creditworthiness Index**

This table presents results of three logistics regressions where the dummy for loan application is the dependent. The explanatory variables are defined in Table 1. Sig.: \*\*\* <.01, \*\* <.05, \* <.10

VARIABLES	Model 1 Loan Application Basic regression				Model 2 Loan Application Regression with country dummies				Model 3 Loan Application Parsimonious model			
	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects
RETAINED_EARNINGS	0.094***	0.027	1.098	0.017	0.148***	0.027	1.160	0.027	0.148***	0.027	1.160	0.027
TRADE_CREDIT	0.498***	0.025	1.645	0.094	0.500***	0.025	1.649	0.094	0.500***	0.025	1.649	0.094
LEASING	0.472***	0.024	1.603	0.09	0.514***	0.025	1.672	0.097	0.514***	0.025	1.672	0.097
EQUITY	0.167***	0.045	1.182	0.032	0.216***	0.046	1.242	0.041	0.216***	0.046	1.242	0.041
WAVES	<i>Included</i>				<i>Included</i>				<i>Included</i>			
COUNTRIES					<i>Included</i>				<i>Included</i>			
CASH_SURPL_DEFICIT	0.002	0.004	1.002	0.001	-0.001	0.007	0.999	-0.001				
NON_PERF	-0.018***	0.004	0.982	-0.003	-0.015	0.012	0.985	-0.003	-0.016	0.011	0.984	-0.003
CREDIT_ACCESS	-0.001	0.001	1.000	0.000	0.004**	0.002	1.004	0.001	0.004**	0.002	1.004	0.001
GDP_GROWTH	-0.030***	0.008	0.97	-0.005	-0.013	0.012	0.988	-0.002	-0.013	0.012	0.988	-0.002
INFLATION	0.183***	0.019	1.201	0.034	0.001	0.024	1.001	0.001	0.001	0.024	1.000	0.000
UNEMPLOYMENT	0.024***	0.002	1.024	0.004	-0.033**	0.013	0.967	-0.006	-0.033***	0.013	0.968	-0.006
HHI	-3.827***	0.190	0.022	-0.701	-3.576**	1.580	0.028	-0.648	-3.595**	1.570	0.028	-0.651
WOMEN	-0.172***	0.037	0.842	-0.030	-0.163***	0.037	0.850	-0.029	-0.163***	0.037	0.850	-0.029
SCORE	0.047***	0.006	1.048	0.009	0.046***	0.006	1.047	0.008	0.046***	0.006	1.047	0.008
CONSTANT	-2.068***	0.08	0.126		-1.055***	0.231	0.348		-1.047***	0.216	0.351	
Observations	41,973				41,973				41,973			
chi2	2,053.0				2587.0				2587.0			
p	0.0000				0.0000				0.0000			
R2	0.0432				0.0544				0.0544			

**Table 7: Modelling Discouraged Borrowers and Firms Creditworthiness**

This table presents two logistics regressions in which the dependent variable is a dummy identifying discouraged borrowers. The explanatory variables are defined in Table 1. Sig.: \*\*\* <.01, \*\* <.05, \* <.10

VARIABLES	Model 1 Discouraged Borrower Basic regression				Model 2 Discouraged Borrower Regression with country dummies			
	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects
RETAINED_EARNINGS	0.135***	0.050	1.145	0.010	0.176***	0.050	1.193	0.012
TRADE_CREDIT	0.257***	0.045	1.293	0.019	0.316***	0.046	1.372	0.022
LEASING	0.036	0.046	1.037	0.003	0.033	0.047	1.034	0.002
EQUITY	0.537***	0.080	1.711	0.047	0.497***	0.082	1.643	0.039
WAVES	<i>Included</i>				<i>Included</i>			
COUNTRIES	<i>Included</i>				<i>Included</i>			
CASH_SURPL_DEFICIT	-0.022***	0.005	0.978	-0.002	-0.007	0.009	0.993	-0.001
NON_PERF	0.030***	0.006	1.030	0.002	0.035**	0.016	1.036	0.002
CREDIT_ACCESS	0.008***	0.002	1.008	0.001	0.008**	0.003	1.008	0.001
GDP_GROWTH	-0.008	0.012	0.992	-0.001	0.030*	0.018	1.031	0.002
INFLATION	-0.049	0.031	0.952	-0.004	0.112***	0.038	1.118	0.007
UNEMPLOYMENT	0.025***	0.004	1.026	0.002	0.107***	0.021	1.113	0.007
HHI	-1.444***	0.337	0.236	-0.102	-10.38***	3.524	0.000	-0.681
WOMEN	0.171***	0.057	1.187	0.013	0.190***	0.058	1.209	0.013
SCORE	-0.152***	0.011	0.859	-0.011	-0.158***	0.011	0.854	-0.010
CONSTANT	-2.320***	0.146	0.098		-3.169***	0.484	0.042	
Observations	31,326				31,326			
chi2	760.6				1078.0			
p	0.0000				0.0000			
R2	0.0413				0.0585			



**Table 8: Modelling Bank Loan Rejection and Firms Creditworthiness**

This table presents three logistics regressions in which the dependent variable is a dummy that defines whether the loan has been rejected (conditional on applying). The explanatory variables are defined in Table 1. Sig.: \*\*\* <.01, \*\* <.05, \* <.10

VARIABLES	Model 1 Rejected Basic regression				Model 2 Rejected Regression with country dummies			
	Coefficients	Std. Dev.	Odds ratio	Marginal Effects	Coefficients	Std. Dev.	Odds ratio	Marginal Effects
RETAINED_EARNINGS	0.236***	0.072	1.266	0.022	0.246***	0.073	1.279	0.022
TRADE_CREDIT	-0.131**	0.066	0.878	-0.012	-0.165**	0.067	0.848	-0.012
LEASING	-0.245***	0.067	0.783	-0.022	-0.259***	0.068	0.772	-0.022
EQUITY	0.241*	0.124	1.272	0.024	0.290**	0.126	1.336	0.028
WAVES	<i>Included</i>				<i>Included</i>			
COUNTRIES	<i>Included</i>				<i>Included</i>			
CASH_SURPL_DEFICIT	-0.034***	0.009	0.967	-0.003	-0.031**	0.016	0.969	-0.003
NON_PERF	0.031***	0.010	1.032	0.003	0.090***	0.027	1.094	0.008
CREDIT_ACCESS	0.006	0.004	1.006	0.001	0.010*	0.006	1.010	0.001
GDP_GROWTH	-0.072***	0.019	0.931	-0.007	-0.102***	0.030	0.903	-0.009
INFLATION	-0.068	0.046	0.934	-0.007	-0.059	0.058	0.943	-0.005
UNEMPLOYMENT	0.017***	0.006	1.017	0.002	-0.013	0.033	0.987	-0.001
HHI	0.786	0.589	2.195	0.072	-18.520***	5.607	0.000	-1.608
WOMEN	0.134	0.095	1.143	0.013	0.139	0.096	1.149	0.013
SCORE	-0.198***	0.017	0.82	-0.018	-0.199***	0.017	0.820	-0.017
CONSTANT	-1.661***	0.231	0.19		0.168	0.724	1.183	

  

Observations	10,647	10,647
chi2	488.5	591.8
p	0.0000	0.0000
R2	0.0633	0.0767